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54 [Title of Invention]
Fluorescence Observation Endoscope Apparatus

57 [Abstract]
[Purpose]
To simplify the switching between a normal image and a fluorescence image with simple structure and reliably detect lesions from fluorescence images.

[Constitution]
A normal image, which is based on white light from a lamp 3a in a normal illumination light source 3, obtained by an endoscope 1 is captured by a normal video camera 6 via a second adapter 5. A fluorescence image, which is based on excitation light λ_0 from a laser apparatus for fluorescence 4, obtained by the endoscope 1 is captured by a fluorescence imaging camera 7 via a second adapter 5. By calculating the ratio of λ_1 and λ_2 in a video-switching controller 10, whether an area is normal or diseased can be distinguished. Based on an identification signal from the video-switching controller 10, a video switcher 11 outputs a normal image or a fluorescence image and output images are displayed on a monitor 12.

[Claim]
[Claim 1]
A fluorescence observation endoscope apparatus, which is characterized by comprising: an endoscope having the insertion part to be inserted in a body cavity by which an observation [normal] image by illumination light and a fluorescence image by excitation light of an area to be observed in the body cavity, which are at the distal end of the aforesaid

insertion part, are transmitted to the proximal end of the insertion part;
a supply means for normal light to supply the aforesaid normal illumination light to the aforesaid endoscope;
a supply means for excitation light to supply the aforesaid excitation light to the aforesaid endoscope;
an normal image generating means which generates a normal display image by the aforesaid normal image;
a fluorescence image generating means which generates a fluorescence display image by the aforesaid fluorescence image; and
a light-quantity detection means which detects a quantity of light of the aforesaid fluorescence image; and
a selecting means which selects between the aforesaid normal display image and the aforesaid fluorescence display image based on the output from the aforesaid light-quantity detection means.

[Detailed Description of the Invention]
[0001]
[Technical Field]
This invention relates to a fluorescence observation apparatus which diagnoses a diseased area based on fluorescence light emitted from an area to be examined on which the excitation light is irradiated.

[0002]
[Prior Art]
[Prior Art]
In recent years, techniques such as auto-fluorescence, which is generated directly from living tissue by irradiating the excitation light to an observation area of living tissue, and drug-induced fluorescence, which is generated by injecting a fluorescent medicine into the organism beforehand, produce two-dimensional images which are used to diagnose the degeneration of tissues of the organism or a state of the disease (for example, the type of the disease or the extent of infiltration), such as a cancer.

[0003]
If excitation light irradiates living tissue, the wavelength of the fluorescence generated will be longer than that of the excitation light.
Fluorescence substances in the organism are, for example, collagen, NADH (nicotinamide adenine dinucleotide), FMN (flavin mononucleotide), pyridine nucleotide, etc. Recently, the interrelation between these substances in the organism emitting fluorescence light and diseases is becoming clear, and the diagnosis of cancer, etc. is possible by this fluorescence.
Alternatively, a fluorescence substance such as HpD (hematoporphyrin), Photofrin, ALA(δ-amino levulinic acid), etc., may be injected into an organism. These substances have a tendency to accumulate in cancerous tissue, and a diseased area can be diagnosed by observing the fluorescence after injecting any of these substances into an organism.

[0004]
Fluorescence emitted is extremely weak so that extremely high sensitivity photography is required. It is widely known that an image intensifier is used for high sensitivity photography.

[0005]
On the other hand, in addition to observing fluorescence images, it is also important to observe a normal image to perform orientation and the like in a fluorescence observation by an endoscope. Conventionally, both fluorescence and normal images are either captured by several cameras or one camera by time-divided manner.

[0006]
[Problem to be Solved]
However, a conventional fluorescence observation endoscope apparatus, which performs fluorescence observation by an endoscope, performs the observation while manually switching between a normal image and a fluorescence image. Thus, normal mages and fluorescence images have to be observed constantly while the insertion part of an endoscope is guided into a body cavity by observing a normal image. This switching operation is complicated, and a diseased area can be missed if a timing of switching is missed.

[0007]
This invention is formed in consideration of the above-mentioned matters. The purpose of this invention is to provide a fluorescence observation endoscope apparatus which simplifies switching of a normal image and a fluorescence image with simple structure and is capable of detecting a diseased area based on a fluorescence image reliably.

[0008]
[Means and Operation to Solve the Problems]
With a fluorescence observation endoscope apparatus, which comprises:
an endoscope having the insertion part to be inserted in a body cavity by which an observation [normal] image by illumination light and a fluorescence image by excitation light of an area to be observed in the body cavity, which are at the distal end of the aforesaid insertion part, are transmitted to the proximal end of the insertion part;

a supply means for normal light to supply the aforesaid normal illumination light to the aforesaid endoscope;
a supply means for excitation light to supply the aforesaid excitation light to the aforesaid endoscope;
an normal image generating means which generates a normal display image by the aforesaid normal image;
a fluorescence image generating means which generates a fluorescence display image by the aforesaid fluorescence image; and
a light-quantity detection means which detects a quantity of light of the aforesaid fluorescence image; and
a selecting means which selects between the aforesaid normal display image and the aforesaid fluorescence display image based on the output from the aforesaid light-quantity detection means,
and by selecting the aforesaid normal image or the fluorescence image by the aforesaid selecting means based on the output from the aforesaid light-quantity detection means, the switching of a normal image and a fluorescence image can be simplified with simple structure and a diseased area can reliably be detected according to the fluorescence image.

[0009]
[Embodiment]
Hereafter, embodiments of this invention are described referring to the drawings.

[0010]
Fig. 1 and Fig. 2 relate to a first embodiment of this invention. Fig. 1 is a diagram showing the structure of a fluorescence observation endoscope apparatus. Fig. 2 is a diagram showing the fluorescence characteristics of tissue in a body cavity when excitation light λ_0 is irradiated from the fluorescence observation endoscope apparatus of Fig. 1.

[0011]
A fluorescence observation endoscope apparatus of the first embodiment as shown in Fig. 1 comprises:
an endoscope 1 which is inserted in a body cavity for acquiring a normal image and a fluorescence image of an observed area such as a lesion;
a normal illumination light source 3 for supplying white light for normal observation to the endoscope 1 via a first adapter 2;
a laser apparatus for fluorescence light 4 for supplying a laser (such as an excimer laser, a krypton laser, a He-Cd laser, a dye laser) with excitation light λ_0 (for example, light of 350 – 500nm);
a normal video camera 6 for detecting a normal image, which is based on white light from a lamp 3a of the normal illumination light source 3, obtained by the endoscope 1 via a second adapter 5;
a fluorescence image detecting camera 7 for detecting a fluorescence image, which is based on the excitation light λ_0 from the laser apparatus for fluorescence light 4, obtained by the endoscope 1 via a second adapter 5;
a CCU (camera control unit) 8 for generating a normal image by processing a normal image-detecting signal detected by the normal video camera 6;
a fluorescence image processor 9 for generating a fluorescence image by processing fluorescence image-detecting signal detected by the fluorescence image detecting camera 7;
a video switching controller 10 for identifying a diseased area by detecting a quantity of fluorescence having wavelength longer than the wavelength of excitation light of fluorescence image-detecting signal, processed by the fluorescence image processor 9;
a video switcher 11 which inputs normal and fluorescence images and outputs normal or fluorescence images based on identification signals from the video switching controller 10; and
a monitor 12 to display output images from the video switcher 11.

[0012]
The first adapter 2 switches between white light from the lamp 3 of the normal illumination light source 3 and excitation light λ_0 from the laser apparatus for fluorescence 4 by operating a movable mirror 14 via a driver 13 (The position of the movable mirror 14 for white light is shown as the solid line and that for excitation light λ_0 is shown as the broken line in Fig. 1) so as to introduce them to a light guide 15 which is inserted thorough the endoscope 1. The light guide 15 transmits light from the first adapter 2 to the distal end of the endoscope 1 and the light is irradiated from the distal end outwardly. A reflected light of the light irradiating the observed area is transmitted to an ocular part 17 of the endoscope 1 through an image guide 16 inserted through the endoscope 1.

[0013]
The second adapter 5 is detachably connected to the ocular part 2. The second adapter 5 introduces a normal image to the normal video camera 6 and a fluorescence image to the fluorescence imaging camera 7 by switching between a normal image and a fluorescence image by operating a movable mirror 19 by a driver 18. (The position of the movable mirror for a normal image is shown as the solid line and that for a fluorescence image is shown as the broken line). The normal video camera 6 detects a normal image by a built-in CCD 20 and transmits a normal imaging signal to the CCU 8.

[0014]
In the fluorescence image-detecting camera 7, an image intensifier (I.I.) 22 amplifies a fluorescence image via a rotatable filter 21. Then, the image is captured by a CCD 23 and a fluorescence image signal is transmitted to the fluorescence image processor 9.

[0015]
Fig. 2 shows the fluorescence characteristics when excitation light λ_0 is irradiated. The intensity of fluorescence generated from a living tissue by excitation light λ_0 at 442nm is stronger in a normal area and the intensity of a diseased area is weaker in shorter wavelength. In other words, the ratio of fluorescence intensity at λ_1, λ_2, varies in a normal area and a diseased area in the drawing. Thus, a diseased area and a normal area can be distinguished by obtaining the ratio of λ_1 and λ_2. By this reason, a fluorescence image is separated into λ_1 and λ_2 by the rotatable filter 21 and captured by the CCD 23.

[0016]
In Fig. 1, the operation of the movable mirrors 14 and 19 by the drivers 13 and 18 are synchronized with a timing controller 25. The timing of the drive of a motor 24 to operate the rotatable filter 21 is also controlled by the timing controller 25.

[0017]
In addition, although the video switcher 11 outputs a normal or a fluorescence image based on an identification signal, a normal or fluorescence image can be switched by a foot switch 26.

[0018]
According to a fluorescence observation endoscope apparatus of the first embodiment, a diseased area and a normal area are distinguished by calculating the ratio of λ_1 and λ_2 by the video-switching controller 10. The output images are displayed on the monitor 12 by outputting normal or fluorescence images by identification signals from the video-switching controller 10. Therefore, a normal image and a fluorescence image can be switched automatically and a diseased area can be reliably detected based on a fluorescence image.

[0019]
Next, a second embodiment will be explained. Fig. 3 through Fig. 5 relate to the second embodiment of this invention. Fig. 3 is a diagram showing the structure of a fluorescence observation endoscope apparatus. Fig. 4 is an explanatory drawing of the irradiation of a therapy laser to a diseased area by the modification of the laser probe in Fig. 3. Fig. 5 is an explanatory drawing of the supply of a therapy laser to the laser probe by the modification of the first adapter of Fig. 3. Since the second embodiment is similar to the first embodiment, only different components are explained and the same symbols are utilized for the same components and the explanations of those are omitted.

[0020]
As shown in Fig. 3, a laser probe 32 is inserted through an instrument channel 31 of the endoscope 1. The laser probe 21 is detachably connected to a first adapter 33. In the first adapter 33, the excitation light from the laser apparatus for fluorescence is separated into two beams of light by a beam splitter 34 and one beam is introduced to the laser probe 32 and the other is introduced to a light guide 15. The two beams of light to the laser probe 32 and the light guide 15 are supplied by moving the movable mirror 14 by the driver 13 [in the same way] as excitation light in the first embodiment. Other structure is the same as that of the first embodiment.

[0021]
By an apparatus comprising such, in the second embodiment, in addition to the effect of the first embodiment, by projecting the tip of the laser probe 32, which is inserted through the instrument channel 31, from the distal end of the endoscope 1, a fluorescence observation area can be expanded, and an area near the distal end of the endoscope and area away from the endoscope can be observed simultaneously. Thus, a diseased area can be detected more reliably.

[0022]
In addition, by providing a condenser 35 having a short focal length at the tip of the laser probe 32, an apparatus can perform a wide range of fluorescence observation as Fig. 4 (a). If a diseased area is detected in organism's tissue 36, it can also perform a laser cauterizing treatment by bringing the tip of the laser probe 32 closer to the diseased area as Fig. 4 (b).
As a method to perform cauterization by laser, as shown in Fig. 5, a laser beam by a therapy laser apparatus 38 can be supplied to a laser probe 32 by additional installing a movable mirror 37 for switching lasers in the first adapter 33. The driver 13 controls the switching timing of the lasers when a diseased area is detected by the laser apparatus for fluorescence 4.
In this case, by increasing numerical aperture (NA) of the excitation light from the laser apparatus for

fluorescence 4 and reducing numerical aperture (NA) of the therapy laser, the radiation per square of excitation light becomes larger. As an observing area is spread, the radiation per square of the therapy laser becomes smaller. A laser with high power density can be irradiated to a diseased area.

[0023]
Next, a third embodiment will be explained. Fig. 6 through Fig. 8 relate to the third embodiment of this invention. Fig. 6 is a diagram showing the structure of a fluorescence observation endoscope apparatus. Fig. 7 is a block diagram showing the structure of a fluorescence light-quantity detection device. Fig. 8 is a timing chart to show operation of the fluorescence light-quantity detection device in Fig. 7. Since the third embodiment is similar to the first embodiment, only different components are explained and the same symbols are utilized for the same components and the explanations of those are omitted.

[0024]
As shown in Fig. 6, a beam splitter 41 for separating a fluorescence image is placed between the second adapter 5 and the fluorescence image-detecting camera 7. The structure is arranged such that a part of the fluorescence light quantity of a fluorescence image separated by the beam splitter 41 is detected by a fluorescence light quantity detection apparatus 42 so that the image display control unit 43, which is placed where the video switcher 11 of the first embodiment was located, controls the displayed image in accordance with the detected quantity of fluorescence light.

[0025]
As shown in Fig. 7, the fluorescence light-quantity detection apparatus 42 causes a dichroic mirror 45 to divide a fluorescence image into two wavelengths λ_1 and λ_2. Then, the quantities of fluorescence light beams having the wavelengths λ_1 and λ_2 are supplied to high sensitive photodiodes (APD) 46 and 47 and are sampled in sample-and-hold circuits (S/H) 48 and 49. The quantities of sampled fluorescence light having the wavelengths λ_1 and λ_2 are calculated by a calculation circuit 50 to determine whether or not the fluorescence light quantity indicates a diseased area. Thus, the timing controller 25 and the image display control unit 43 are controlled.

[0026]
If the fluorescence light quantity indicating a diseased area is not detected, the fluorescence light quantity detection apparatus 42 controls the timing controller 25 to lengthen the time in which white light is irradiated by the normal illumination (observation) light source 3 as shown in Fig. 8 (a), and shorten the time in which excitation light is irradiated by the laser apparatus for fluorescence light 4 as shown in Fig. 8 (b). As a result, an observed image having sufficient brightness can be obtained if a diseased are is not present. Thus, the operation for inserting the endoscope and the like can be facilitated. If a quantity of fluorescence light indicating a diseased area is detected, the timing controller 25 shortens the time in which white light is irradiated by the normal illumination light source 3 as in Fig. 8 (c) and lengthens the tine in which excitation light is irradiated by the laser apparatus for fluorescence light 4 as in Fig. 8 (d). As a result, a fluorescence image having sufficient brightness can be obtained if a diseased area is present. Thus, a diagnosis of a diseased area and the like can be performed easily.

[0027]
Next, a fourth embodiment is explained. Fig. 9 and Fig. 10 relate to the fourth embodiment of this invention. Fig. 9 is a block diagram of the principal part of a fluorescence observation endoscope apparatus. Fig. 10 is a block diagram showing a modification of the principal part of the fluorescence observation endoscope apparatus of Fig. 9. Since the fourth embodiment is similar to the first embodiment, only different components are explained and the same symbols are utilized for the same components and the explanation of those are omitted.

[0028]
In the fourth embodiment of Fig. 9, a separate image guide for fluorescence light 62 is provided in the endoscope 61, in addition to an image guide 16. In the second adapter 63 in which the images from the image guide 16 and the image guide for fluorescence 62 are incident, the image from the image guide 16 is captured by a normal video camera 6 via a slide switch 64 and a mirror 65, and the image from the image guide for fluorescence 62 is captured by a fluorescence image detecting camera 7 via the slide switch 64. The slide switch 64 switches images from the image guide 16 and the image guide for fluorescence 62 by the driver 18 so as to transmit the images to the normal video camera 6 and the fluorescence image detecting camera 7. The switching timing is the same as the timing of the movable mirror 19 in the first embodiment.

[0029]
According to the fourth embodiment, in addition to the effect of the first embodiment, it can be made simple without proving a means to separate a normal image and a fluorescence image.

[0030]
In addition, in the fourth embodiment, the image from the image guide 16 is captured by the normal video camera 6 via the slider switch 64 and the mirror 65. However, it can be structured to capture a normal image by built-in CCD 70 on the distal end of the endoscope 61 as shown in Fig. 10.

[0031]
Moreover, in each embodiment described above, the CCD 20 in the normal video camera 6 was structured to capture images based on white light. However, the CCD 20 may be made into a CCD which captures a color image by providing a color mosaic filter on the incident surface of the CCD 20. The normal video camera may also be made to capture a color image by providing a color filter to separate white light into R, G, and B. In addition, by making R, G, and B lights sequentially supplied from the normal illumination light source 36, a normal video camera may be made to capture a color image by synchronizing with the timing of light supply to capture a color image.

[0032]
[Effect of the Invention]
According to this invention described above, since a normal (observation) image or a fluorescence image is selected by the selecting means in accordance with the output of the light quantity detection means, the invention has the effect that the switching between a normal image and a fluorescence image can be simplified with simple structure and a diseased area can be detected reliably based on a fluorescence image.

[Brief Explanation of Drawings]
[Fig. 1]
Fig. 1 is a diagram showing a fluorescence observation endoscope apparatus of a first embodiment.

[Fig. 2]
Fig. 2 is a characteristic diagram of a fluorescence characteristic of tissue in a body cavity when excitation light λ_0 is irradiated from a fluorescence observation endoscope apparatus of Fig. 1.

[Fig. 3]
Fig. 3 is a diagram showing a fluorescence observation endoscope apparatus of a second embodiment.

[Fig. 4]
Fig. 4 is a drawing explaining the irradiation of therapy laser to a diseased area by a modification of a laser probe in Fig. 3.

[Fig. 5]
Fig. 5 is an explanatory drawing of the supply of a therapy laser to the laser probe by the modification of the first adapter in Fig. 3.

[Fig. 6]
Fig. 6 is a diagram showing the structure of a fluorescence observation endoscope apparatus of a third embodiment.

[Fig. 7]
Fig. 7 is a block diagram of a fluorescence light quantity detection apparatus of Fig. 6.

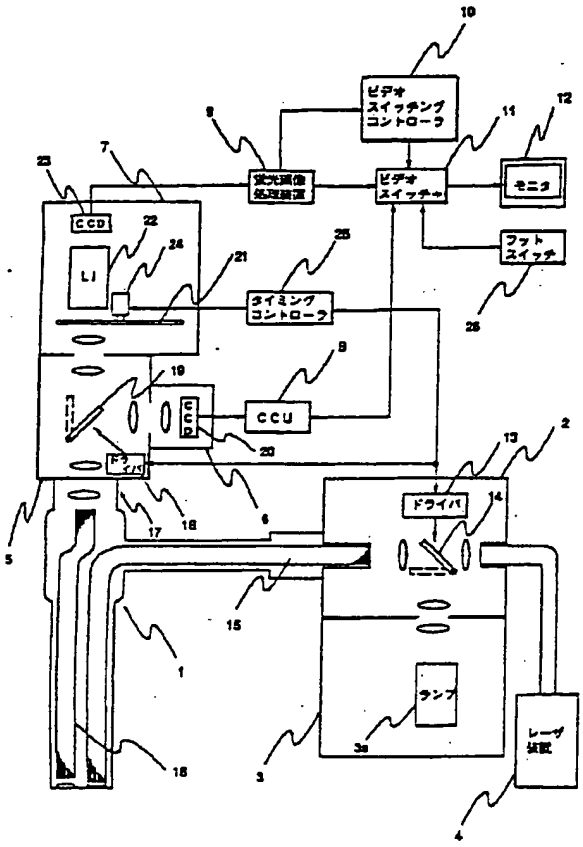
[Fig. 8]
Fig. 8 is a timing chart explaining the operation of the fluorescence light quantity detection apparatus of Fig. 7.

[Fig. 9]
Fig. 9 is a structural diagram of the principal part of a fluorescence observation endoscope apparatus of a fourth embodiment.

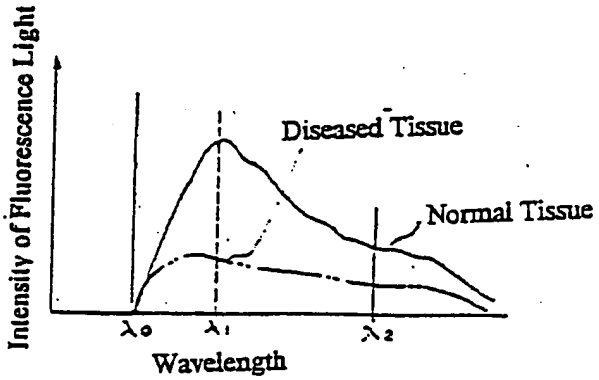
[Fig. 10]
Fig. 10 is a structural diagram of the principal part of a modified fluorescence observation endoscope apparatus of Fig. 9.

[Symbols]
1...endoscope
2...first adapter
3...normal illumination light source
3a..lamp
4...laser apparatus for fluorescence light
5...second adapter
6...normal video camera
7...fluorescence image detecting camera
8...CCU
9...fluorescence image processor
10...video switching controller
11...video switcher
12...monitor
13, 18...driver
14, 19...movable mirror
15...light guide
16...image guide
20, 23...CCD
21...rotatable filter
22...I.I.
25...timing controller

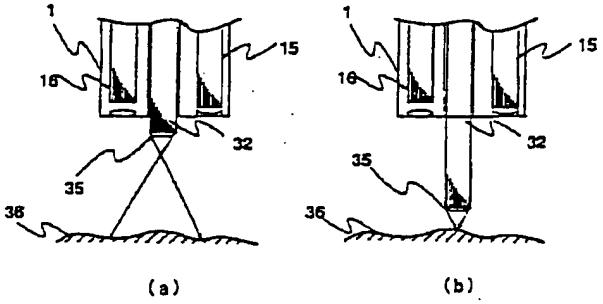
[Fig. 1]



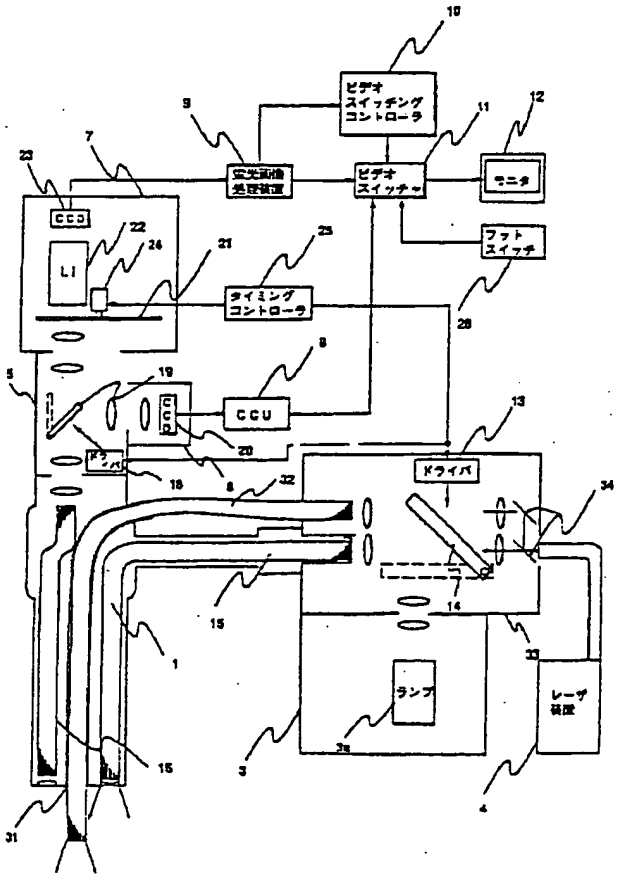
[Fig. 2]



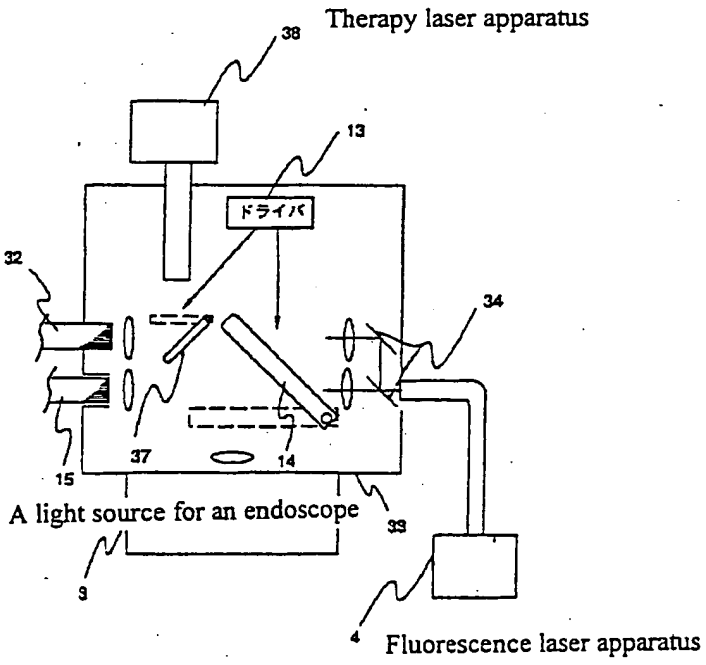
[Fig. 4]



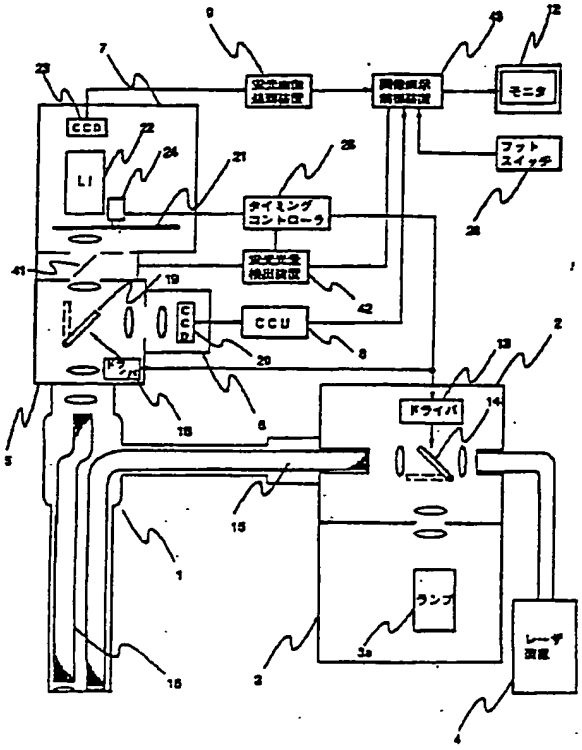
[Fig. 3]



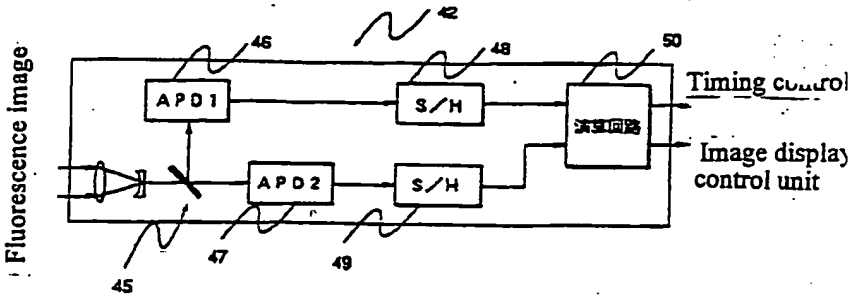
[Fig. 5]



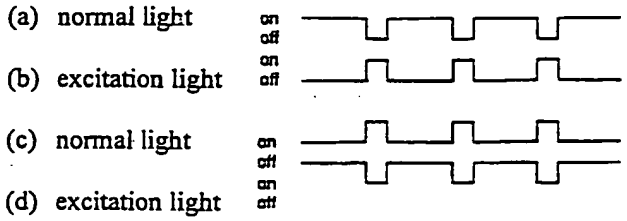
[Fig. 6]



[Fig. 7]

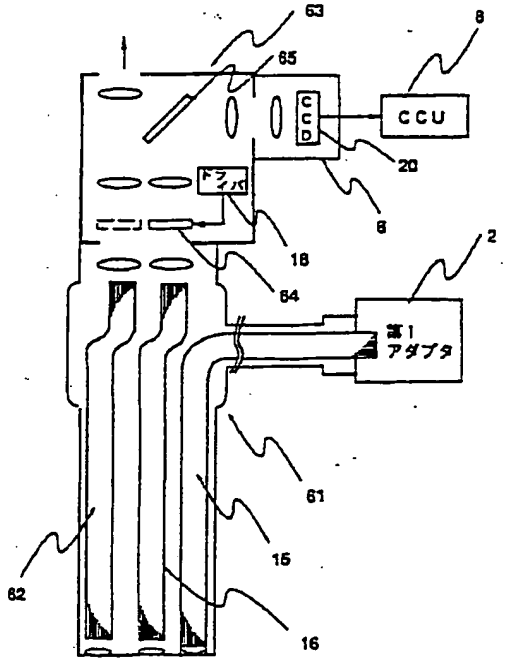


[Fig. 8]



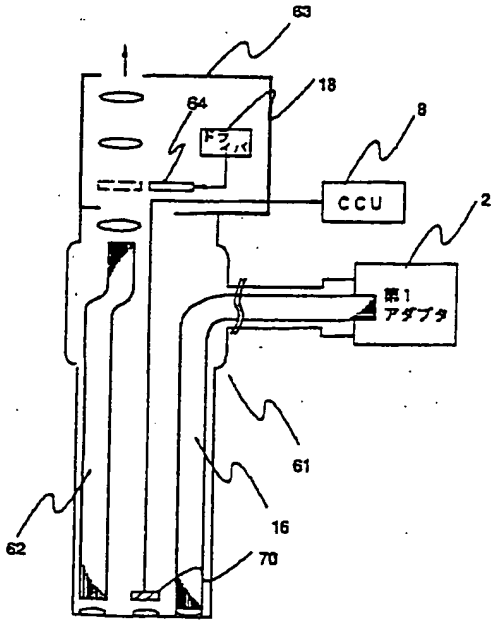
[Fig. 9]

Fluorescence image-detecting camera



[Fig. 10]

Fluorescence image-detecting camera



[AMENDMENT]

[Filing Date]
January 13, Heisei 6

[Amendment 1]

[Title of Document for Amendment]
Description

[Item to be Amended]
0021

[Method of Amendment]
Modification

[Content of Amendment]
[0021]
By an apparatus comprising such, in the second embodiment, in addition to the effect of the first embodiment, by projecting the tip of the laser probe 32, which is inserted through the instrument channel 31, from the distal end of the endoscope 1, a fluorescence observation area can be expanded, and an area near the distal end of the endoscope and an area away from the endoscope can be observed simultaneously. Thus, a diseased area can be detected more reliably.
In addition, although it is not shown in Fig. 3, the structure may be arranged such that white light from the lamp 3a is introduced to both the laser probe 32 and the light guide 15 similar to the structure for excitation light. In this case, a normal observation area can be expanded.

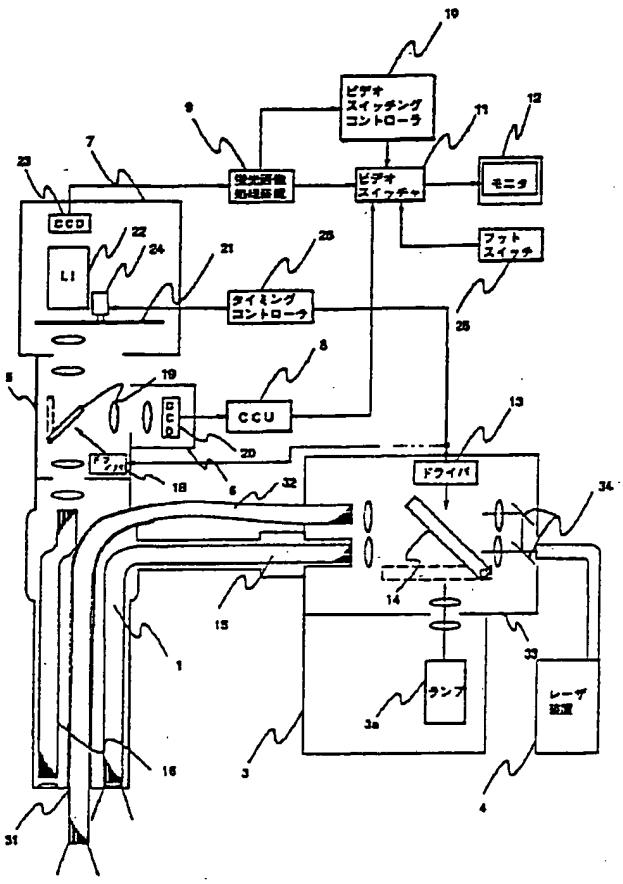
[Amendment 2]

[Title of Document for Amendment]
Drawing

[Items to be Amended]
Fig. 3

[Method of Amendment]
Modification

[Content of Amendment]
[Fig. 3]



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(57)【要約】

(57)[SUMMARY]

【目的】
簡単な構成により、通常観察像と蛍光像との切り換えを簡素化すると共に、確実に蛍光像による疾患部位の検出を行う

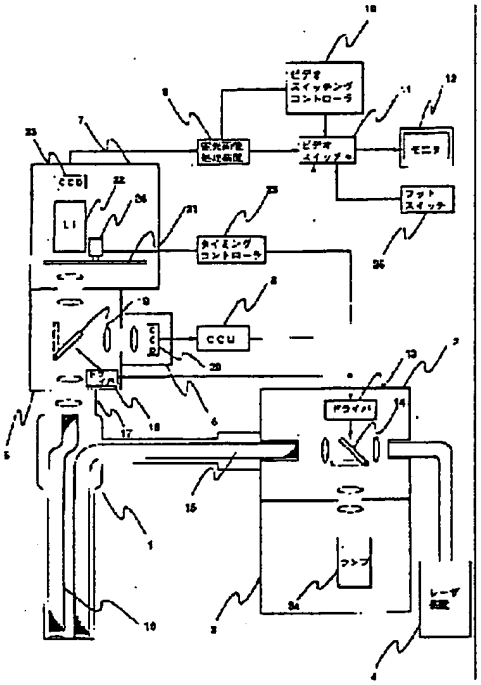
[OBJECT]
By a simple constitution, while simplifying switching an ordinary observed image and a fluorescent image, the detection of the illness site by the fluorescent image is performed reliably.

【構成】
通常ＴＶカメラ６で通常照明光源３のランプ３ａからの白色光により内視鏡１で得られた通常観察像を第２アダプタ５を介して撮像し、蛍光像撮像カメラ７で蛍光用レーザ装置４からの励起光λ０により内視鏡１で得られた蛍光像を第２アダプタ５を介して撮像して、ビデオスイッチングコントローラ１０でλ１，λ２の比率を求めることで

[SUMMARY OF THE INVENTION]
The ordinary observed image obtained by the endoscope 1 according to the white light from lamp 3a of the ordinary illumination light source 3 is photographed through the second adaptor 5 with the ordinary TV camera 6.
The fluorescent image obtained by the endoscope 1 by the excitation light (lambda) 0 from the laser apparatus for fluorescence 4 is photographed through the second adaptor 5 by the fluorescent image photographing camera 7.
A lesion or normal is distinguished by

病変と正常を区別し、ビデオスイッチャ１１がビデオスイッチングコントローラ１０からの識別信号により通常画像または蛍光画像を出力して、モニタ１２で出力画像を表示する。

obtaining the ratio of 1 (lambda) and 2 (lambda) by the video switching controller 10. The video switcher 11 outputs an ordinary image or a fluorescent image with the identification signal from the video switching controller 10, and displays an output image with a monitor 12.



3a : lamp, 4 : Laser apparatus for fluorescence, 9 : Fluorescence image processor, 10 : Video switching controller, 11 : Video switcher, 12 : Monitor, 13 : Driver, 18 : Driver, 25 :Timing controller, 26 : Foot switch

【特許請求の範囲】

[CLAIMS]

【請求項１】

体腔内に挿入する挿入部を有し、前記挿入部先端に位置する

[CLAIM 1]

The endoscope which has an insertion part inserted in an intra-corporeal, and transmits the

体腔内観察部位の通常照明光の観察像及び励起光による蛍光像を前記挿入部基端側に伝送する内視鏡と、
前記内視鏡に前記通常照明光を供給する通常光供給手段と、
前記内視鏡に前記励起光を供給する励起光供給手段と、
前記観察像により観察画像を生成する観察画像生成手段と、
前記蛍光像により蛍光画像を生成する蛍光画像生成手段と、
前記蛍光画像の光量を検出する光量検出手段と、
前記光量検出手段の出力に基づいて、前記観察像または前記蛍光画像を選択する選択手段とを備えたことを特徴とする蛍光観察内視鏡装置。

observed image of the ordinary illumination light of the intra-corporeal observation site which is positioned at the above-mentioned end of an insertion part, and the fluorescent image by excitation light to an above-mentioned insertion-part base-end side, ordinary-light supply means to supply an above-mentioned ordinary illumination light to an above-mentioned endoscope, excitation-light supply means to supply above-mentioned excitation light to an above-mentioned endoscope, observation image formation means to form an observation image by the above-mentioned observed image, fluorescent image formation means to form a fluorescent image with an above-mentioned fluorescent image, quantity-of-light detection means to detect the quantity of light of an above-mentioned fluorescent image, and choice means to choose an above-mentioned observed image or an above-mentioned fluorescent image based on the output of above-mentioned quantity-of-light detection means are provided.

The fluorescent observation endoscope apparatus characterized by the above-mentioned.

【発明の詳細な説明】

[DETAILED DESCRIPTION OF INVENTION]

【０００１】

[0001]

【産業上の利用分野】

本発明は、被検査対象に励起光を照射し、その被検査対象から

[INDUSTRIAL APPLICATION]

This invention relates to the fluorescent observing apparatus which diagnoses the

発する蛍光より、疾患部位を診断する蛍光観察装置に関する。

illness site from the fluorescence which is emitted from the tested object by radiating excitation light for a tested object.

【０００２】

[0002]

【従来の技術】
近年、内視鏡等により生体からの自家蛍光や、生体へ薬物を注入し、その薬物の蛍光を２次元画像として検出し、その蛍光像から、生体組織の変性や癌等の疾患状態（例えば、疾患の種類や浸潤範囲）を診断する技術がある。

[PRIOR ART]
In recent years, a private fluorescence from the organism by the endoscope etc. and the fluorescence of the medicine by injecting a medicine to the organism are detected as a two-dimensional image.

From the fluorescent image, there is a technique that illness condition (for example, the kind and permeation range of the illness), such as the denaturation of a living tissue and cancer, is diagnosed.

【０００３】
生体組織に光を照射するとその励起光より長い波長の蛍光が発生する。生体における蛍光物質として、例えばＮＡＤＨ（ニコチンアミドアデニンヌクレオチド），ＦＭＮ（フラビンモノヌクレオチド），ピリジンヌクレオチド等がある。最近では、このような、生体内因物質と、疾患との相互関係が明確になってきた。また、ＨｐＤ（ヘマトポルフィリン），Ｐｈｏｔｏｆｒｉｎ，ＡＬＡ（δ－ａｍｉｎｏｌｅｖｕｌｉｎｉｃ ａｃｉｄ）は、癌への集積性があり、これを生体内に注入し、前記物

[0003]
If a light is irradiated to a living tissue, the fluorescence of a wavelength longer than the excitation light will generate.

As the fluorescent material in the organism, for example, there are NADH (nicotinamide adenine nucleotide), FMN (flavine mononucleotide), pyridine nucleotide, etc.

Recently, the interactive relationship between an endogenous substance in-the-living-body and the illness became clear.

Moreover, HpD (hematoporphyrin), Photofrin, and ALA (delta) (-amino levulinic acid) have the integrated property to cancer.
The illness site can be diagnosed by injecting this into the living body and observing the fluorescence of an above-mentioned material.

質の蛍光を観察することで疾患部位を診断できる。

【０００４】
このような蛍光は、極めて微弱であるので、その観察のためには、極めて高感度の撮影を必要とする。この高感度撮影を行うものとしてイメージ・インテンシファイヤが良く知られている。

[0004]
Since such a fluorescence is very feeble, it needs very high sensitive photography for the observation.

The image * intensifier is well known as that which performs this high sensitive photography.

【０００５】
一方、内視鏡による蛍光観察においては、蛍光像の他、通常の画面の観察も、オリエンテーション等を行う上で重要である。従来では、蛍光像と通常像の両方を撮影するため、複数のカメラを使用したり、又、同一のカメラを時分割で撮影していた。

[0005]
On the one hand, in a fluorescent observation according to an endoscope, in addition to a fluorescent image, the observation of a ordinary screen is also important when performing an orientation etc.

Conventionally, some cameras are used, in order to take photographs of both fluorescent image and ordinary image

Moreover, photographs are also taken by an identical camera by the time division.

【０００６】

[0006]

【発明が解決しようとする課題】
しかしながら、従来の内視鏡による蛍光観察を行う蛍光観察内視鏡装置においては、通常観察像と蛍光像とを手動で切り換えながら観察を行っている為、通常観察像により内視鏡の挿入部を体腔内へ導きながら、随時、

[PROBLEM ADDRESSED]
However, in the fluorescent observing endoscope apparatus which performs the fluorescent observation by the conventional endoscope, since it is observing, switching an ordinary observed image and a fluorescent image by manual operation, guiding the insertion part of an endoscope to an intra-corporeal by the ordinary observed image, an

通常観察像と蛍光像を行わなければならならず、この切り換えの作業は煩雑であり、また、切り換えのタイミングを誤ると、疾患部位を見逃すといった問題がある。

ordinary observed image and a fluorescent image must be performed at any time, and operation of this switch is complicated.

Moreover, when mistaking the timing of switching, there is a problem of overlooking the illness site.

【０００７】

本発明は、上記事情に鑑みてなされたものであり、簡単な構成により、通常観察像と蛍光像との切り換えを簡素化すると共に、蛍光像による疾患部位の検出が確実にできる蛍光観察内視鏡装置を提供することを目的としている。

[0007]

This invention is made in view of an above situation.

It aims at providing the fluorescent observing endoscope apparatus which can do reliably the detection of the illness site by the fluorescent image by a simple constitution, while simplifying switching an ordinary observed image and a fluorescent image.

【０００８】

[0008]

【課題を解決するための手段及び作用】

体腔内に挿入する挿入部を有し、前記挿入部先端に位置する体腔内観察部位の通常照明光の観察像及び励起光による蛍光像を前記挿入部基端側に伝送する内視鏡と、前記内視鏡に前記通常照明光を供給する通常光供給手段と、前記内視鏡に前記励起光を供給する励起光供給手段と、前記観察像により観察画像を生成する観察画像生成手段と、前記蛍光像により蛍光画像を生成する蛍光画像生成手段と、前記蛍光画像の光量を検出

[A SOLUTION OF THE INVENTION and an effect]

The endoscope which has an insertion part inserted in an intra-corporeal, and transmits the observed image of the ordinary illumination light of the intra-corporeal observation site which is positioned at the above-mentioned end of an insertion part, and the fluorescent image by excitation light to an above-mentioned insertion-part base-end side, the ordinary-light supply means to supply an above-mentioned ordinary illumination light to an above-mentioned endoscope, the excitation-light supply means to supply above-mentioned excitation light to an above-mentioned endoscope, the observation image formation

する光量検出手段と、前記光量検出手段の出力に基づいて、前記観察像または前記蛍光画像を選択する選択手段とを備え、前記選択手段により前記光量検出手段の出力に基づいて、前記観察像または前記蛍光画像を選択することで、簡単な構成により、通常観察像と蛍光像との切り換えを簡素化すると共に、確実な蛍光像による疾患部位の検出を可能とする。

means to form an observation image by the above-mentioned observed image, the fluorescent image formation means to form a fluorescent image with an above-mentioned fluorescent image, the quantity-of-light detection means to detect the quantity of light of an above-mentioned fluorescent image, and the choice means to choose an above-mentioned observed image or an above-mentioned fluorescent image based on the output of above-mentioned quantity-of-light detection means are provided.

By choosing an above-mentioned observed image or an above-mentioned fluorescent image by above-mentioned choice means based on the output of above-mentioned quantity-of-light detection means, while simplifying switching an ordinary observed image and a fluorescent image by a simple constitution, the detection of the illness site by the reliable fluorescent image is made possible.

【０００９】

[0009]

【実施例】

以下、図面を参照しながら本発明の実施例について述べる。

[Example]

Hereafter, the Example of this invention is described, referring drawing.

【００１０】

図１及び図２は本発明の第１実施例に係わり、図１は蛍光観察内視鏡装置の構成を示す構成図、図２は図１の蛍光観察内視鏡装置により励起光λ０を照射した時の体腔内組織の蛍光特

[0010]

Figs. 1 and 2 is involved in the 1st Example of this invention.

Diagram 1 is a block diagram showing the constitution of a fluorescent observing endoscope apparatus. Diagram 2 is a characteristic view showing the fluorescent

性を示す特性図である。

characteristic of the intra-corporeal structure when irradiating excitation light (lambda) 0 by the fluorescent observing endoscope apparatus of Diagram 1.

【００１１】

第１実施例の蛍光観察内視鏡装置は、図１に示すように、体腔内に挿入し疾患部位等の観察部位の通常観察像及び蛍光観察像を得る内視鏡１と、この内視鏡１に第１アダプタ２を介して通常観察用の白色光を供給する通常照明光源３及び励起光λ０（例えば３５０ｍｍ～５００ｍｍの光）のレーザ（例えばエキシマレーザ、クリプトンレーザ、Ｈｅ－Ｃｄレーザ、色素レーザ）を供給する蛍光用レーザ装置４と、通常照明光源３のランプ３ａからの白色光により内視鏡１で得られた通常観察像を第２アダプタ５を介して撮像する通常ＴＶカメラ６と、蛍光用レーザ装置４からの励起光λ０により内視鏡１で得られた蛍光像を第２アダプタ５を介して撮像する蛍光像撮像カメラ７と、通常ＴＶカメラ６により撮像された通常観察撮像信号を信号処理し通常画像を生成するＣＣＵ（カメラ・コントロール・ユニット）８と、蛍光像撮像カメラ７により撮像された蛍光撮像信号を信号処理し蛍光画像を生成する蛍光画像処理装置９と、蛍光画像

[0011]

The fluorescent observing endoscope apparatus of the 1st Example, as shown in Diagram 1, the endoscope 1 which inserts in an intra-corporeal and obtains the ordinary observed image and the fluorescent observed images of the observation site, such as the illness site the ordinary illumination light source 3 which supplies the white light for a ordinary observation to this endoscope 1 through the 1st adaptor 2, and the laser apparatus for fluorescence 4 which supplies the laser of excitation light (lambda) 0 (for example, 350 mm - 500 mm light) (For example, an excimer laser, a krypton laser, a He-Cd laser, dye laser) the ordinary TV camera 6 which photographs the ordinary observed image obtained by the endoscope 1 according to the white light from lamp 3a of the ordinary illumination light source 3 through the second adaptor 5, the fluorescent image photographing camera 7 which photographs the fluorescent image obtained by the endoscope 1 by the excitation light (lambda) 0 from the laser apparatus for fluorescence 4 through the second adaptor 5, CCU8 which carries out the signal processing of the ordinary observation photograph signal photographed by the ordinary TV camera 6, and forms an ordinary image (camera * control * unit), the fluorescent image processor 9 which carries out the signal processing of the fluorescent

処理装置９で信号処理される蛍光撮像信号の励起光より長い波長の蛍光光量を検出し疾患部位を識別するビデオスイッチングコントローラ１０と、通常画像及び蛍光画像を入力しビデオスイッチングコントローラ１０からの識別信号により通常画像または蛍光画像を出力するビデオスイッチャ１１と、ビデオスイッチャ１１からの出力画像を表示するモニタ１２とを備えて構成される。

photograph signal photographed by the fluorescent image photographing camera 7, and forms a fluorescent image, the video switching controller 10 which detects the fluorescent quantity of light of a wavelength longer than the excitation light of the fluorescent photographing signal by which a signal processing is carried out by the fluorescent image processor 9, and distinguishes the illness site, the video switcher 11 which inputs an ordinary image and a fluorescent image and outputs an ordinary image or a fluorescent image with the identification signal from the video switching controller 10, and the monitor 12 which displays the output image from the video switcher 11 are provided and it is constituted.

【００１２】
第１アダプタ２は、ドライバ１３で可動ミラー１４を駆動することにより通常照明光源３のランプ３ａからの白色光と蛍光用レーザ装置４からの励起光λ０を切り換え（図１において、白色光の場合の可動ミラー１４の位置は実線、励起光λ０の場合の可動ミラー１４の位置は破線）、内視鏡１内を挿通するライトガイド１５に導光するようになっている。ライトガイド１５は第１アダプタ２からの光を内視鏡１の先端に伝送し、先端前方に照射するようになっている。照射された光による観察部位からの戻り光は観察像（通常

[0012]
The 1st adaptor 2 switches the white light from lamp 3a of the ordinary illumination light source 3, and the excitation light (lambda) 0 from the laser apparatus for fluorescence 4 by driving the movable mirror 14 by the driver 13. (In Diagram 1, the position of the movable mirror 14 in the case of the white light is a continuous line. The position of the movable mirror 14 in the case of excitation light (lambda) 0 is a broken line.) A light-guide is carried out to the light guide 15 which passes through the inside of an endoscope 1.

A light guide 15 transmits the light from the 1st adaptor 2 at the end of an endoscope 1. It irradiates the end forward.

The return light from the observation site by the irradiated light is transmitted as an observed

観察像あるいは蛍光観察像）として内視鏡１内を挿通するイメージガイド１６により内視鏡１の接眼部１７に伝送される。

image (an ordinary observed image or fluorescent observed image) to the eye-piece part 17 of an endoscope 1by the image guide 16 which passes through the inside of an endoscope 1.

【００１３】
接眼部２には第２アダプタ５が着脱自在に接続されており、第２アダプタ５は、ドライバ１８で可動ミラー１９を駆動することにより通常観察像と蛍光観察像とを切り換え（通常観察像の場合の可動ミラー１９の位置は実線、蛍光観察像の場合の可動ミラー１９の位置は破線）、通常観察像を通常ＴＶカメラ６に、蛍光像を蛍光像撮像カメラ７に導く。通常ＴＶカメラ６では、内蔵するＣＣＤ２０により通常観察像を撮像し、通常観察撮像信号をＣＣＵ８に伝送する。

[0013]
The second adaptor 5 is detachably connected to the eye-piece part 2.

The second adaptor 5 switches between ordinary observed image and a fluorescent observed image by driving the movable mirror 19 by the driver 18. (The position of the movable mirror 19 in an ordinary observed image is a continuous line. The position of the movable mirror 19 in a fluorescent observed image is a broken line.) An ordinary observed image is guided to an ordinary TV camera 6, and a fluorescent image is guided to a fluorescent image photographing camera 7.

In an ordinary TV camera 6, an ordinary observed image is photographed by CCD20 incorporated, and a ordinary observation photographing signal is transmitted to CCU8.

【００１４】
蛍光像撮像カメラ７では、蛍光観察像を回転フィルタ２１を介してイメージ・インテンシファイヤ（Ｉ．Ｉ）２２で光増幅しＣＣＤ２３で撮像し、蛍光撮像信号を蛍光画像処理装置９に伝送する。

[0014]
In a fluorescent image photographing camera 7, optical amplification of the fluorescent observed image is carried out by the image * intensifier (I.I) 22 through the rotation filter 21, and it photographs by CCD23. A fluorescent photograph signal is transmitted to the fluorescent image processor 9.

【００１５】
ここで、図２に励起光λ０を照

[0015]
Here, the fluorescent characteristic when

射した時の蛍光特性を示す。例えば４４２ｍｍの励起光λ０で得られる組織の蛍光は、正常部位ではその強度が強く、病変部では、波長の短い側で正常に比べ弱い。つまり、図中λ１，λ２と正常と病変で蛍光強度の比率が異なるので、このλ１，λ２の比率を求めることで病変と正常を区別することができる。そのため、回転フィルタ２１によりλ１，λ２の蛍光像を分離してＣＣＤ２２で撮像するようになっている。

irradiating excitation light (lambda) 0 is shown in a diagram 2.

For example, at the normal site, the strength of the fluorescence of the structure obtained by the 442 mm excitation light (lambda) 0 is strong.

In a lesion, is weak compared the normality at the side with a wavelength short.

The ratio of a fluorescence intensity depends on (lambda) 1, (lambda) 2, normal and the lesion in other words in the drawing. Therefore, the lesion and normal can be distinguished by obtaining this ratio of (lambda) 1 and (lambda) 2.

For this reason, the rotation filter 21 separates the fluorescent image of 1 (lambda) and 2 (lambda), and it photographs by CCD22.

【００１６】
そして、図１において、可動ミラー１４、１９はタイミングコントローラ２５により同期してドライバ１３、１８で駆動され、回転フィルタ２１を回転駆動するモータ２４の駆動タイミングもタイミングコントローラ２５により制御されている。

[0016]
And, in Diagram 1, the movable mirrors 14 and 19 synchronize by the timing controller 25, and are driven by drivers 13 and 18. Driving timing of the motor 24 which carries out the rotation driving of the rotation filter 21 is also controlled by the timing controller 25.

【００１７】
尚、ビデオスイッチャ１１は、識別信号により通常画像または蛍光画像を出力するが、フットスイッチ２６によっても通常画像または蛍光画像の切り換えができるようになっている。

[0017]
In addition, the video switcher 11 outputs an ordinary image or a fluorescent image with an identification signal.

However, it has come to be able to perform the switch of an ordinary image or a fluorescent image also by the foot switch 26.

【００１８】
このように、第１実施例の蛍光観察内視鏡装置によれば、ビデオスイッチングコントローラ１０でλ１，λ２の比率を求めることで病変と正常を区別し、ビデオスイッチャ１１がビデオスイッチングコントローラ１０からの識別信号により通常画像または蛍光画像を出力して、モニタ１２で出力画像を表示するので、通常観察像と蛍光像との切り換えが自動的に行われると共に、蛍光像による疾患部位の検出が確実にできる。

[0018]
In this way, according to the fluorescent observing endoscope apparatus of the 1st Example, the lesion and the normal are distinguished by obtaining the ratio of (lambda) 1 and (lambda) 2 by the video switching controller 10.
The video switcher 11 outputs an ordinary image or a fluorescent image with the identification signal from the video switching controller 10.

Since an output image is displayed with a monitor 12, while the switch of an ordinary observed image and a fluorescent image is performed automatically, the detection of the illness site by the fluorescent image is made reliably.

【００１９】
次に第２実施例について説明する。図３ないし図５は本発明の第２実施例に係わり、図３は蛍光観察内視鏡装置の構成を示す構成図、図４は図３のレーザプローブの変形例による病変部への治療用レーザの照射を説明する説明図、図５は図３の第１アダプタの変形例による治療用レーザのレーザプローブへの供給を説明する説明図である。第２実施例は第１実施例とほとんど同じであるので、異なる構成のみ説明し、同一構成には同じ符号をつけ説明は省略する。

[0019]
Next a second Example is demonstrated.
Fig. 3 or 5 is involved in the second Example of this invention.

Diagram 3 is a block diagram showing the constitution of a fluorescent observing endoscope apparatus. Diagram 4 is an explanatory drawing explaining irradiation of the laser for treatments to the disease part by the modification of the laser probe of a diagram 3. Diagram 5 is an explanatory drawing explaining the supply to the laser probe of the laser for treatments by the modification of the 1st adaptor of Diagram 3.
Since the second Example is almost the same as the 1st Example, it demonstrates only different constitution.

Attachment description omits the same

symbol as the same constitution.

【００２０】
図３に示すように、第２実施例では内視鏡１の処置具チャンネル３１にレーザプローブ３２が挿通されるようになっている。レーザプローブ３２は、第１アダプタ３３に着脱自在に接続されており、第１アダプタ３３は、蛍光用レーザ装置からの励起光をビームスプリッタ３４により２本の光束に分離し、一方をレーザプローブ３２、他方をライトガイド１５に導光するようになっている。この２本の光束は第１実施例の励起光と同様に可動ミラー１４で白色光とドライバ１４により切り換えてレーザプローブ３２、ライトガイド１５に供給される。その他の構成は第１実施例と同じである。

[0020]
As shown in Diagram 3, in the second Example, the laser probe 32 passes through to the treatment-tool channel 31 of an endoscope 1.

The laser probe 32 is detachably connected to the 1st adaptor 33.

The 1st adaptor 33 separates the excitation light from the laser apparatus for fluorescence into two beams by the beam splitter 34.

One side is used as the laser probe 32, and the other is light-guided to a light guide 15.

These two beams are switched by the white light and the driver 14 by the movable mirror 14 like the excitation light of the 1st Example. The laser probe 32 and the light guide 15 are supplied.

The other constitution is the same as that of the 1st Example.

【００２１】
このように構成することで、第２実施例では、第１実施例の効果に加え、処置具チャンネル３１に挿通されたレーザプローブ３２の先端を、内視鏡１の先端より突出させることで、蛍光観察領域を拡大することができ、内視鏡先端近傍と、内視鏡から離れた領域を同時に観察することができるので、より確実に疾患部位の検出が行える。

[0021]
By constituting in this way, in addition the effect of the 1st Example, the second Example can expand a fluorescent observation area, making the end of the laser probe 32 passed through by the treatment-tool channel 31 project from the end of an endoscope 1.

Since the area near the endoscope end separated from the endoscope can be observed simultaneously, the detection of the illness site can be performed more reliably.

【００２２】
尚、図４に示すように、レーザプローブ３２の先端に焦点距離の短い集光レンズ３５を設けることで、図４（ａ）のように広い範囲の蛍光観察を行うと共に、生体組織３６の疾患部位が検出された場合に、図４（ｂ）に示すように、レーザプローブ３２の先端を疾患部位に近づけることで、直ちにレーザ焼灼治療を行うことができる。また、レーザ焼灼治療を行う方法として、図５に示すように、第１アダプタ３３に可動ミラー３７を追加構成することで、治療用レーザ装置３８からのレーザ光をレーザプローブ３２に切り換えて供給するようにしてもよく、切り換えのタイミングは、蛍光用レーザ装置４により疾患部位が検出された場合に行われるようにドライバ１４により制御される。この場合、レーザプローブ３２への蛍光用レーザ装置４からの励起光の入射Ｎ．Ａを大きくし、治療用レーザの入射Ｎ．Ａを小さくすることで、励起光の出射角が大きくなり、観察領域が広がると共に、治療用レーザの出射角が小さくなり、大きなパワー密度のレーザを疾患部位に照射できる。

[0022]
In addition, as shown in Diagram 4, when the illness site of a living tissue 36 is detected while performing the fluorescent observation of a wide range as shown in Diagram 4 (a), by providing the condenser 35 with a short focal distance at the end of the laser probe 32, as shown in Diagram 4 (b), bringing the end of the laser probe 32 close to the illness site can perform a laser cauterisation treatment immediately.

Moreover, as the method of performing a laser cauterisation treatment, as shown in Diagram 5, by carrying out amendment constitution of the movable mirror 37 at the 1st adaptor 33, the laser radiation from the laser apparatus for treatments 38 is switched to the laser probe 32 and may be made to supply.

Timing of switching is controlled by the driver 14 to be carried out when the illness site is detected by the laser apparatus for fluorescence 4.
In this case, incidence N.A of the excitation light from the laser apparatus for fluorescence 4 to the laser probe 32 is enlarged.

By making incidence N.A of the laser for treatments small, the radiation square of excitation light becomes large.

While an observation area spreads, the radiation square of the laser for treatments becomes small.

The laser of a big power density can be irradiated to the illness site.

【００２３】
次に第３実施例について説明す

[0023]
Next the 3rd Example is demonstrated.

る。図６ないし図８は本発明の第３実施例に係わり、図６は蛍光観察内視鏡装置の構成を示す構成図、図７は図６の蛍光光量検出装置の構成を示すブロック図、図８は図７の蛍光光量検出装置の作用を説明するタイミング図である。第３実施例は第１実施例とほとんど同じであるので、異なる構成のみ説明し、同一構成には同じ符号をつけ説明は省略する。

Figs. 6- 8 are involved in the 3rd Example of this invention.

Diagram 6 is a block diagram showing the constitution of a fluorescent observing endoscope apparatus. Diagram 7 is a block diagram showing the constitution of the fluorescent quantity-of-light detector of Diagram 6. Diagram 8 is a timing diagram explaining an effect of the fluorescent quantity-of-light detector of Diagram 7.

Since the 3rd Example is almost the same as the 1st Example, it demonstrates only different constitution.

The same symbol is attached to the same constitution. Description is omitted.

【００２４】

図６に示すように、第２アダプタ５と蛍光像撮像カメラ７との間に蛍光像を分離するビームスプリッタ４１を設け、ビームスプリッタ４１により分離された蛍光像の蛍光光量を蛍光光量検出装置４２で検出することで、蛍光光量に基づいて第１実施例のビデオスイッチャ１１に代わる画像表示制御装置４３で表示画像を制御するように構成される。

[0024]

As shown in Diagram 6, the beam splitter 41 which separates a fluorescent image between the second adaptor 5 and the fluorescent image photographing camera 7 is provided.

It is constituted so that a display image may be controlled by the image display control 43 which substitutes the video switcher 11 of the 1st Example based on a fluorescent quantity of light, by detecting the fluorescent quantity of light of the fluorescent image separated by the beam splitter 41 by the fluorescent quantity-of-light detector 42.

【００２５】

蛍光光量検出装置４２は、図７に示すように、ダイクロックミラー４５により蛍光像を２つの波長帯域λ１，λ２に分割し、高感度フォトダイオード（ＡＰ

[0025]

The fluorescent quantity-of-light detector 42 divides a fluorescent image into two wavelength bands (lambda) 1 and 2 (lambda) by the dike lock mirror 45, as shown in Diagram 7. The sampling of each fluorescent quantity of light of

D）４６、４７で２つの波長帯域λ１，λ２の各々の蛍光光量をサンプルホールド回路（Ｓ／Ｈ）４８、４９でサンプリングする。サンプリングされた波長帯域λ１，λ２の各々の蛍光光量を演算回路５０で演算し、病変部を示す蛍光光量であるかどうかを判断することで、タイミングコントローラ２５及び画像表示制御装置を制御するようになっている。

two wavelength bands (lambda) 1 and (lambda) 2 is carried out by sample-and-hold circuits (S/H) 48 and 49 by the high sensitive photodiodes (APD) 46 and 47.
Each fluorescent quantity of light of the wavelength bands (lambda) 1 and 2 (lambda) by which the sampling was carried out is calculated in the calculation circuit 50.

The timing controller 25 and an image display control are controlled by judging whether it is the fluorescent quantity of light which shows a disease part.

【００２６】
蛍光光量検出装置４２では、病変部を示す蛍光光量が検出されない場合は、タイミングコントローラ２５に対して、図８（ａ）に示すように、通常観察光源３からの白色光の照射期間を長く、図８（ｂ）に示すように、蛍光用レーザ装置４からの励起光の照射期間を短くするように制御する。この結果、病変部がない場合には十分な明るさを有した観察画像を得ることができ、内視鏡の挿入手技等が容易になる。また病変部を示す蛍光光量が検出された場合は、タイミングコントローラ２５に対して、図８（ｃ）に示すように、通常観察光源３からの白色光の照射期間を短く、図８（ｄ）に示すように、蛍光用レーザ装置４からの励起光の照射期間を長くするように制御する。この結

[0026]
In the fluorescent quantity-of-light detector 42, when the fluorescent quantity of light which shows a disease part is not detected, as shown in Diagram 8 (a), to the timing controller 25, it makes the irradiation period of the white light from the ordinary observation light source 3 long.

It controls to make the irradiation period of the excitation light from the laser apparatus for fluorescence 4 short, as shown in Diagram 8 (b).

Consequently, when there is no disease part, the observation image with sufficient brightness can be obtained.

The inserting acquisition work of an endoscope etc. becomes easy.

Moreover, when the fluorescent quantity of light which shows a disease part is detected, as shown in Diagram 8 (c), to the timing controller 25, it makes the irradiation period of the white light from the ordinary observation light source 3 short.

果、病変部がある場合には十分な明るさを有した蛍光画像を得ることができ、病変部の診断等が容易になる。

It controls to makes the irradiation period of the excitation light from the laser apparatus for fluorescence 4 long, as shown in Diagram 8 (d).

Consequently, when there is a disease part, the fluorescent image with sufficient brightness can be obtained.

A diagnosis of a disease part etc. becomes easy.

【００２７】
次に第４実施例について説明する。図９及び図１０は本発明の第４実施例に係わり、図９は蛍光観察内視鏡装置の要部の構成を示す構成図、図１０は図９の蛍光観察内視鏡装置の変形例の要部の構成を示す構成図である。第４実施例は第１実施例とほとんど同じであるので、異なる構成のみ説明し、同一構成には同じ符号をつけ説明は省略する。

[0027]
Next the 4th Example is demonstrated.
Figs. 9 and 10 are involved in the 4th Example of this invention.

Diagram 9 is a block diagram showing the constitution of the principal part of a fluorescent observing endoscope apparatus. Diagram 10 is a block diagram showing the constitution of the principal part of the modification of the fluorescent observing endoscope apparatus of Diagram 9.
Since the 4th Example is almost the same as the 1st Example, it demonstrates only different constitution.

The same symbol is attached to the same constitution and description is omitted.

【００２８】
第４実施例は、図９に示すように、内視鏡６１にイメージガイド１６とは別に蛍光用イメージガイド６２を設けている。そしてイメージガイド１６及び蛍光用イメージガイド６２からの像を入射する第２アダプタ６３では、イメージガイド１６からの像はスライドスイッチ６４及び

[0028]
The 4th Example has provided the image guide for fluorescence 62 in the endoscope 61 independently from image guide 16, as shown in Diagram 9.

And by the second adaptor 63 which carries out incidence of the image from the image guide 16 and the image guide for fluorescence 62, it photographs the image from the image guide 16 by the ordinary TV camera 6 through

ミラー６５を介して通常ＴＶカメラ６で撮像され、蛍光用イメージガイド６２からの像は、スライドスイッチ６４を介して蛍光像撮像カメラ７で撮像されるようになっている。スライドスイッチ６４は、ドライバ１８によりイメージガイド１６からの像と蛍光用イメージガイド６２からの像との像を切り換えて通常ＴＶカメラ６と蛍光像撮像カメラ７に伝送するようになっていて、その切り換えタイミングは第１実施例の可動ミラー１９の切り換えタイミングと同じである。

the slide switch 64 and the mirror 65. The image from the image guide for fluorescence 62 is photographed by the fluorescent image photographing camera 7 through a slide switch 64.

A slide switch 64 switches the image of the image from the image guide 16, and the image from the image guide for fluorescence 62 by the driver 18, and transmits to an ordinary TV camera 6 and the fluorescent image photographing camera 7.

The change timing is the same as that of the change timing of the movable mirror 19 of the 1st Example.

【００２９】

このように第４実施例によれば、第１実施例の効果に加え、通常観察像と蛍光像を分離する手段を設けることなく、簡単に構成できる。

[0029]

Thus, according to the 4th Example, in addition to the effect of the 1st Example, it can constitute easily without providing means to separate an ordinary observed image and a fluorescent image.

【００３０】

尚、第４実施例ではイメージガイド１６からの像はスライドスイッチ６４及びミラー６５を介して通常ＴＶカメラ６で撮像するとしたが、図１０に示すように、内視鏡６１先端にＣＣＤ７０を内蔵させることで、通常観察像を撮像するように構成しても良い。

[0030]

In addition, in the 4th Example, the image from the image guide 16 presupposed is supposed to photograph by the ordinary TV camera 6 through the slide switch 64 and the mirror 65.

However, as shown in Diagram 10, it may constitute so that an ordinary observation image may be photographed by making CCD70 incorporate at endoscope 61 end.

【００３１】

[0031]

尚、上記各実施例では通常ＴＶカメラ６のＣＣＤ２０を白色光に基づいて撮像するとしたが、このＣＣＤ２０は入射面にカラーモザイクフィルタを設けれことでカラー画像を撮像するＣＣＤとすることができる。また、白色光をＲ，Ｇ，Ｂに分離するカラーフィルタを設けることでカラー画像を撮像する通常ＴＶカメラとしても良いし、通常照明光源３６からＲ，Ｇ，Ｂの照明光を順次供給するようにし、この供給タイミングに同期させることでカラー画像を撮像する通常ＴＶカメラとしても良い。

In addition, in each Example, CCD20 of an ordinary TV camera 6 is supposed to photograph based on the white light.

However, this CCD20 can be set to CCD which photographs a colour image by providing a colour mosaic filter to a plane of incidence.

Moreover, it is good also as an ordinary TV camera which photographs a colour image by providing the colour filter which separates the white light into R, G, and B.

It is made to sequentially supply the illumination light of R, G, and B from the ordinary illumination light source 36.

It is good also as an ordinary TV camera which photographs a colour image by making it synchronize with this supply timing.

【００３２】

[0032]

【発明の効果】

以上説明したように本発明によれば、選択手段により光量検出手段の出力に基づいて、観察像または蛍光画像を選択することで、簡単な構成により、通常観察像と蛍光像との切り換えを簡素化すると共に、確実に蛍光像による疾患部位の検出を行うことができるという効果がある。

[EFFECT OF THE INVENTION]

As explained above, according to this invention, by choosing an observed image or a fluorescent image by choice means, based on the output of quantity-of-light detection means, the effect that the detection of the illness site by the fluorescent image can be performed reliably while simplifying switching between an ordinary observed image and a fluorescent image by a simple constitution, is expectable.

【図面の簡単な説明】

[BRIEF EXPLANATION OF DRAWINGS]

【図１】

第１実施例に係る蛍光観察内視

[FIGURE 1]

The block diagram showing the constitution of

鏡装置の構成を示す構成図。

the fluorescent observing endoscope apparatus based on the 1st Example.

【図２】
図１の蛍光観察内視鏡装置により励起光λ０を照射した時の体腔内組織の蛍光特性を示す特性図。

[FIGURE 2]
The characteristic view showing the fluorescent characteristic of the intra-corporeal structure when irradiating excitation light (lambda) 0 by the fluorescent observing endoscope apparatus of Diagram 1.

【図３】
第２実施例に係る蛍光観察内視鏡装置の構成を示す構成図。

[FIGURE 3]
The block diagram showing the constitution of the fluorescent observing endoscope apparatus based on the second Example.

【図４】
図３のレーザプローブの変形例による病変部への治療用レーザの照射を説明する説明図。

[FIGURE 4]
Explanatory drawing explaining irradiation of the laser for treatments to the disease part by the modification of the laser probe of Diagram 3.

【図５】
図３の第１アダプタの変形例による治療用レーザのレーザプローブへの供給を説明する説明図。

[FIGURE 5]
Explanatory drawing explaining the supply to the laser probe of the laser for treatments by the modification of the 1st adaptor of Diagram 3.

【図６】
第３実施例に係る蛍光観察内視鏡装置の構成を示す構成図。

[FIGURE 6]
The block diagram showing the constitution of the fluorescent observing endoscope apparatus based on the 3rd Example.

【図７】
図６の蛍光光量検出装置の構成を示すブロック図。

[FIGURE 7]
The block diagram showing the constitution of the fluorescent quantity-of-light detector of Diagram 6.

【図８】
図７の蛍光光量検出装置の作用を説明するタイミング図。

[FIGURE 8]
The timing diagram explaining an effect of the fluorescent quantity-of-light detector of Diagram 7.

【図９】
第４実施例に係る蛍光観察内視鏡装置の要部の構成を示す構成図。

[FIGURE 9]
The block diagram showing the constitution of the principal part of the fluorescent observing endoscope apparatus based on the 4th Example.

【図１０】
図９の蛍光観察内視鏡装置の変形例の要部の構成を示す構成図。

[FIGURE 10]
The block diagram showing the constitution of the principal part of the modification of the fluorescent observing endoscope apparatus of Diagram 9.

【符号の説明】
１…内視鏡
２…第１アダプタ
３…通常照明光源
４…蛍光用レーザ装置
５…第２アダプタ
６…通常ＴＶカメラ
７…蛍光像撮像カメラ
８…ＣＣＵ
９…蛍光画像処理装置
１０…ビデオスイッチングコントローラ
１１…ビデオスイッチャ
１２…モニタ
１３、１８…ドライバ
１４、１９…可動ミラー
１５…ライトガイド
１６…イメージガイド

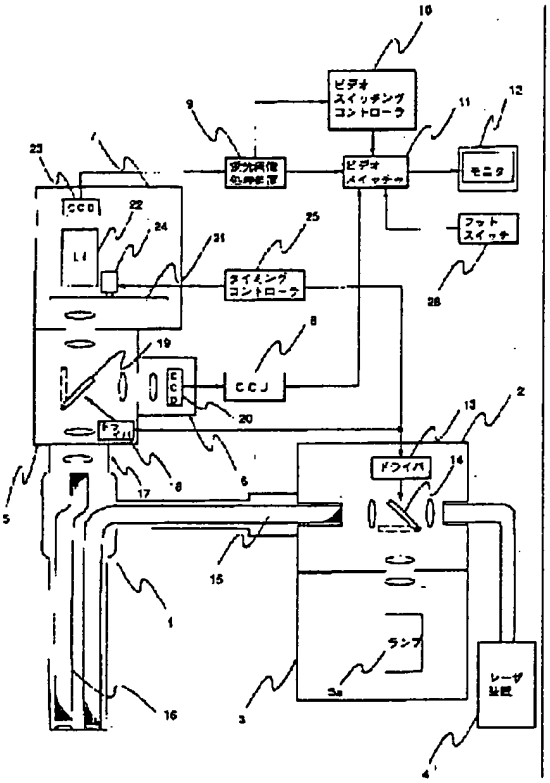
[EXPLANATION OF DRAWING]
1... endoscope
2... the 1st adaptor
3... Ordinary illumination light source
4... The laser apparatus for fluorescence
5... second adaptor
6... ordinary TV camera
7... fluorescent image photographing camera
8...CCU
9... fluorescence image processor
10... video switching controller
11... video switcher
12... monitor
13, a 18... driver
14, a 19... movable mirror
15... light guide
16... image guide
20, 23...CCD

２０、２３…ＣＣＤ
２１…回転フィルタ
２２…Ｉ．Ｉ
２５…タイミングコントローラ

21... rotation filter
22...I.I
25... timing controller

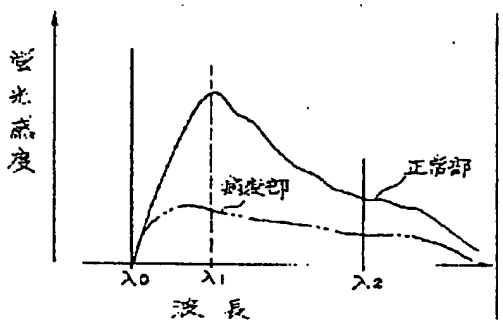
【図１】

[FIGURE 1]



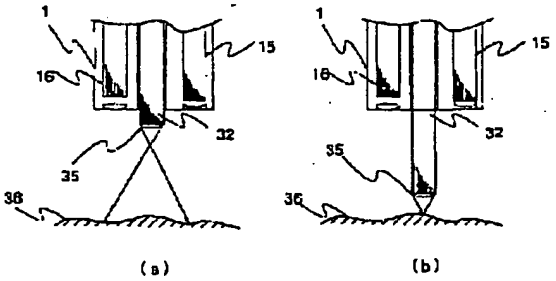
3a : lamp, 4 : Laser apparàtus for fluorescence, 9 : Fluorescence image processor, 10 : Video switching controller, 11 : Video switcher, 12 : Monitor, 13 : Driver, 18 : Driver, 25 :Timing controller, 26 : Foot switch

【図２】 [FIGURE 2]

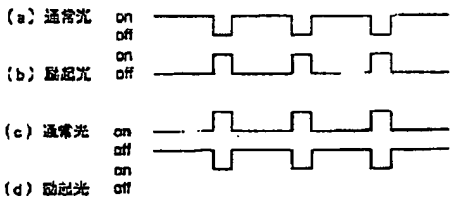


Vertical axis : Fluorescent sensitivity,
Horizontal axis : Wavelength
upper curve : Normal
lower curve : lesion

【図４】 [FIGURE 4]

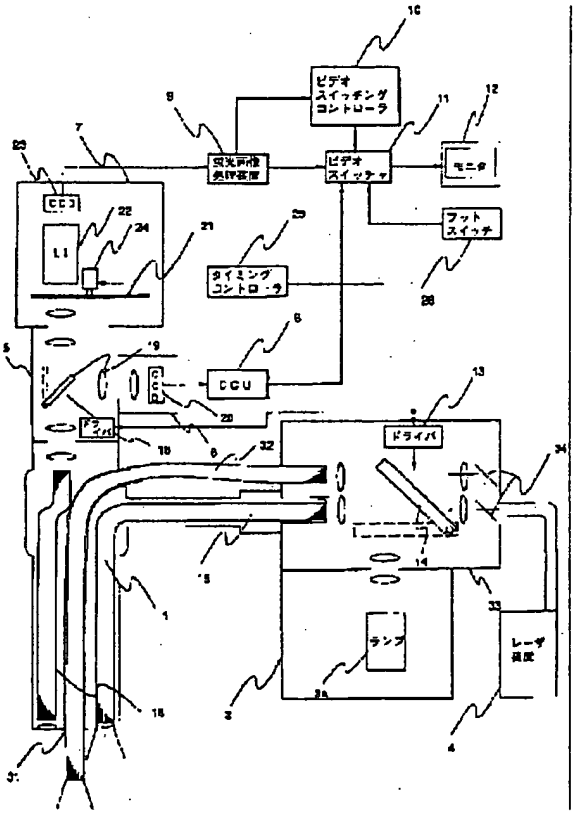


【図８】 [FIGURE 8]



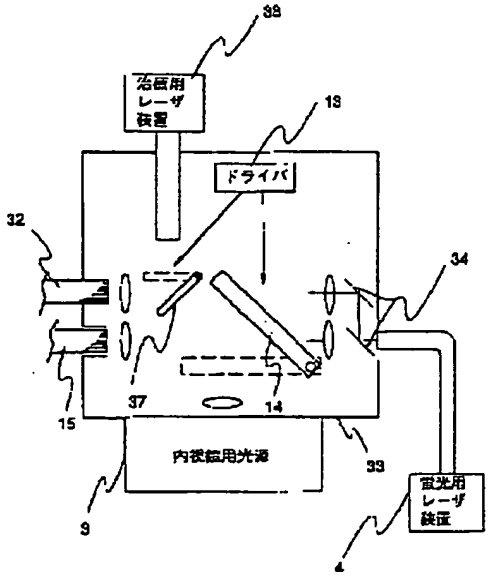
(a) , (c): Ordinary light, (b), (d) : Excitation light

【図３】 [FIGURE 3]



3a : lamp, 4 : Laser apparatus for fluorescence, 9 : Fluorescence image processor, 10 : Video switching controller, 11 : Video switcher, 12 : Monitor, 13 : Driver, 18 : Driver, 25 :Timing controller, 26 : Foot switch

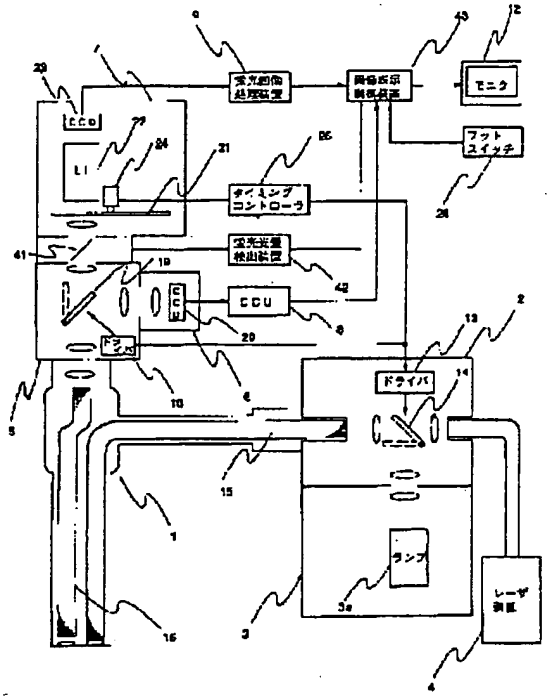
【図５】 [FIGURE 5]



3 : Light source for endoscopes, 4 : Laser apparatus for fluorescence, 13 : Driver, 38 : Laser aparatus for treatments

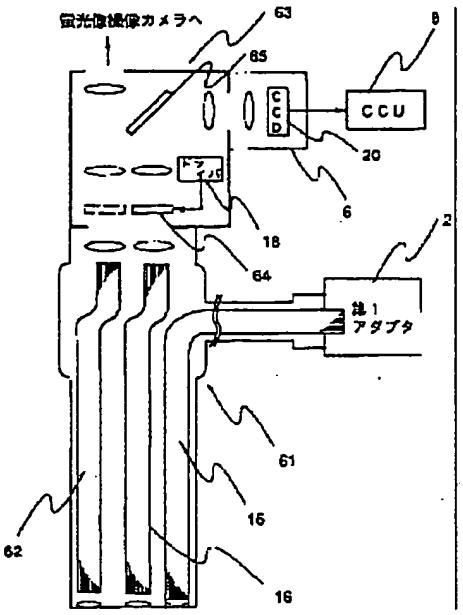
【図６】

[FIGURE 6]



3a : lamp, 4 : Laser apparatus for fluorescence, 9 : Fluorescence image processor, 12 : Monitor, 13 : Driver, 18 : Driver, 25 :Timing controller, 26 : Foot switch, 42 : Fluorescent quantity detector, 43: Image display controller

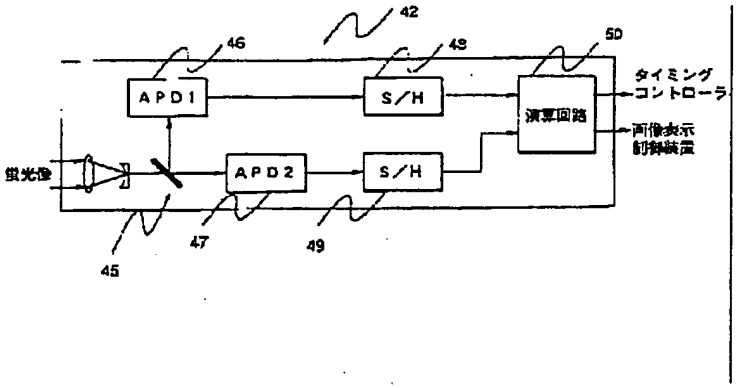
【図９】 [FIGURE 9]



2 : First adaptor

Arrow : To fluorescent image photographing camera

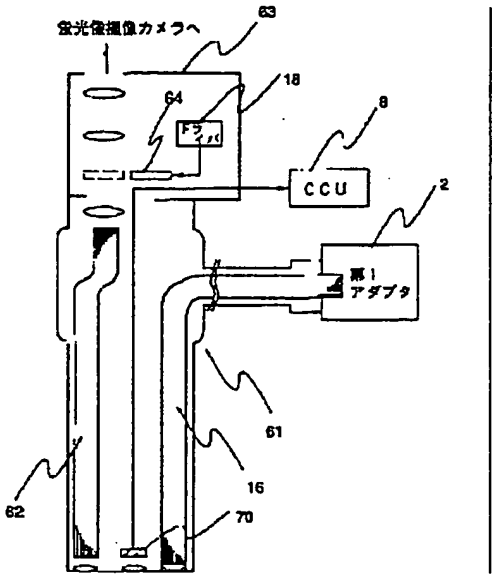
【図７】 [FIGURE 7]



Left : Fluorescent image,
Right upper : Timing controller, lower : Image display controller
Calculation circuit

【図１０】

[FIGURE 10]



2 : First adaptor, 18 : Driver
Arrow : To fluorescent image photographing camera

【手続補正書】

[AMENDMENTS]

【提出日】
平成６年１月１３日

[Filing date]
January 13, Heisei 6

【手続補正１】

[Amendment 1]

【補正対象書類名】
明細書

[Title of document for amendment]
Description

【補正対象項目名】　００２１

【補正方法】　変更

【補正内容】

【００２１】
このように構成することで、第２実施例では、第１実施例の効果に加え、処置具チャンネル３１に挿通されたレーザプローブ３２の先端を、内視鏡１の先端より突出させることで、蛍光観察領域を拡大することができ、内視鏡先端近傍と、内視鏡から離れた領域を同時に観察することができるので、より確実に疾患部位の検出が行える。尚、図３には示していないが、ランプ３ａからの白色光についても励起光と同様に、レーザプローブ３２とライトガイド１５との両方に導光する構成にしてもよく、この場合は通常観察領域を拡大することができる。

【手続補正２】

【補正対象書類名】
図面

【補正対象項目名】　図３

【補正方法】　変更

[Item to be amended] 0021

[Method of amendment] Alteration

[Content of amendment]

[0021]
By constituting in this way, in the second Example, in addition to the effect of the 1st Example, a fluorescent observation area is expandable by making the end of the laser probe 32 passed through by the treatment-tool channel 31 project from the end of an endoscope 1.

Since the area near the endoscope end separated from the endoscope can be observed simultaneously, the detection of the illness site can be performed more reliably.

In addition, although not shown in Diagram 3, it may make to the constitution which light-guide white light from lamp 3a to both laser probe 32 and light guide 15, like excitation light.

In this case an ordinary observation area is expandable.

[Procural Amendment2]

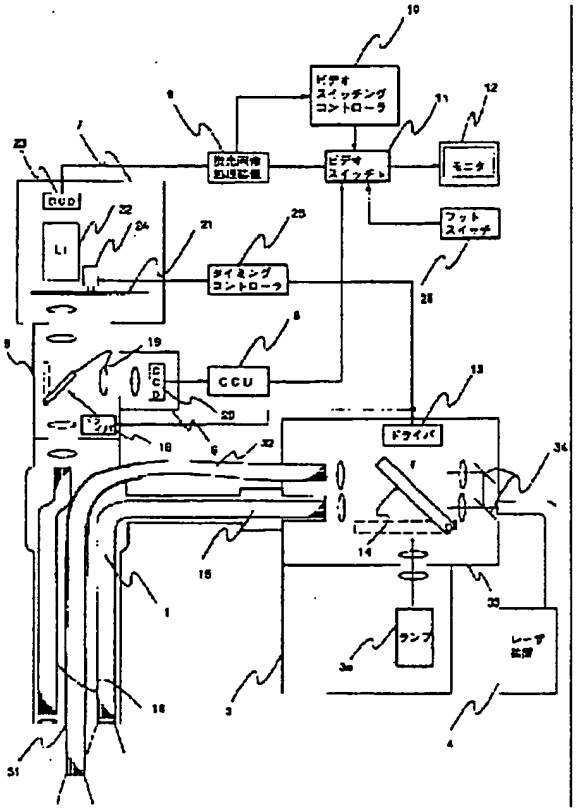
[Title of document for amendment]
Drawing

[Item to be amended] Diagram 3

[Method of amendment] Alteration

【補正内容】 [Content of amendment]

【図３】 [FIGURE 3]



3a : lamp, 4 : Laser apparatus for fluorescence, 9 : Fluorescence image processor, 10 : Video switching controller, 11 : Video switcher, 12 : Monitor, 13 : Driver, 18 : Driver, 25 :Timing controller, 26 : Foot switch

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